



U.S. Department of
Federal Aviation Administration

Aeromedical Research Resume

Research Project Initiative Subtask for FY00

1. Title: Characterization of Cabin Environmental Factors with Longer Term Health Implications: Radiation Exposure; Cabin Air Quality (FAA-NIOSH Project)	2. Sponsoring Organization/Focal Point: AAM-1: Jon L. Jordan, M.D.	3. Originator Name, Organization Dennis V. Canfield, Ph.D. AAM-600 Civil Aeromedical Institute 405-954-6252
		4. Origination Date: March 3, 1999 Start Date: October 1, 1999
5. Parent RPI Number: N/A	6. Subtask Number: AM-A-00-PHY-305	7. Completion Date: September 30, 2002
8. Parent MNS: Aeromedical Research (159)	9. RPD Manager Name, Organization, Phone: Dennis V. Canfield, Ph.D. AAM-600, FAA Civil Aeromedical Institute (405) 954-5262	
10. Research Objective(s): 1. Identify and provide estimates of flight attendant reproductive health risks and status from exposure to ionizing and nonionizing radiation in the aviation environment; 2. Assess factors that significantly affect flight crew and passenger health from historical reviews, field monitoring studies, and research that have been conducted by other agencies, organizations, and institutions. 3. Evaluate factors that significantly influence disease transmission, symptoms, and health effects that are related to commercial aircraft cabin environmental quality, and recommend requirements that are essential to health and safety in commercial aircraft. 11. Technical Summary: Data derived from this research is responsive to the FAA's congressional mandate to evaluate cabin environmental conditions and to establish a research program with other federal agencies, such as the National Institute for Occupational Safety and Health (NIOSH) under the Centers for Disease Control and Prevention. Research has also been conducted at CAMI and computer programs developed/improved to estimate the amount of galactic and solar cosmic radiation received during air travel and the health risks to aircrews and to their offspring from such radiation exposure. In addition, other potential radiation health hazards in the aviation environment, such as RF/microwave radiation, are being evaluated by NIOSH. This collaborative research with NIOSH provides indirect approaches to the understanding of air cabin disease transmission, symptoms, and health effects, which may result from changes in cabin air quality or other factors. Direct epidemiological studies of disease transmission in the air cabin environment are not feasible with currently available technology. These studies will provide sufficient information to generate recommendations and effective interventions.		

12. Resources Requirements:	<u>FY00</u>	<u>FY01</u>	<u>FY02</u>		
FAA Staff Years	5	5	5		
13. Description of Work: (1) Brief Background A 1993 FAA and NIOSH Interagency Agreement (IA) permitted the conduct of research to evaluate the risks to flight attendants' reproductive health. A FAA computer program to estimate the amount of galactic and solar cosmic radiation has been developed and improved for use in this study. The work on ionizing and nonionizing radiation has a 36 year FAA corporate history, and is related to providing the regulatory arm of the FAA with material necessary to develop advisories and/or regulations that will ensure a safe environment for the passenger and worker in the civil aviation setting. Additional studies have been identified (and incorporated in amendments to the FAA-NIOSH IA) to serve as a comprehensive research program of exposure characterization of cosmic radiation, indoor cabin air quality, and other physical factors. In the more recent development, a 1997 IA between the FAA and NIOSH was signed in response to the Congressional mandate for the FAA to examine factors affecting cabin air quality and to establish a research program in this area. (2) Statement of Work This project has three major components: a. Cosmic radiation hazards can be predicted with sufficient accuracy to preclude relevant concerns for occupants of current aircraft and future high-speed civil transports. A solar flare advisory system can be defined that permits timely and appropriate response by users of the civil aviation system. b. The relationship between flight activity and respiratory symptomology in the context of complete flight history data, controlling for lifestyle factors, will be analyzed. The questionnaire for the Reproductive History contains a panel of respiratory symptom questions excerpted from national surveys including the National Health Interview Survey (NHIS). These questions address respiratory infections and noninfectious symptoms for current and last-year time periods. In addition to predominantly non-flying comparison group of teachers, a second large comparison population is available from the questions' surveys of origin (e.g., NHIS). c. Air movements in commercial aircraft cabins will be studied to determine factors that may affect generation, dispersal, and removal of aerosols in the cabin. Potential factors include airflow patterns, ventilation characteristics, the number and size of particles, and humidity. Primary means to accomplish this will be computational fluid dynamics models that show cabin airflow movement. Results may be used to assess the possibility of disease transmission on commercial aircraft, and recommendations will be made relative to aircraft cabin environment requirements.					
14. Intended End Products / Deliverables: Office of Aviation Medicine and open scientific literature reports are prepared that describe the radiation environment at air carrier flight altitudes and provide information on associated health risks. Computer software is developed that estimate the amount of galactic and solar cosmic radiation received on individual flights. Computational models that predict bioaerosol flow movement in aircraft and control strategies that minimize the possibility of disease transmission in different types of aircraft will be developed, and the potential respiratory health risks associated with work as a flight attendant and potential exposures to passengers will be determined and reported in peer-reviewed scientific literature. The third FAA-NIOSH component of the research will also provide an independent assessment of commercial aircraft cabin environmental parameters, as currently required and/or recommended, and this information will be provided directly to Congress per the Appropriations Committee language defining this facet of the research program.					

<p>15. Schedule/Milestones:</p> <ol style="list-style-type: none"> Interim update of guidelines for cabin occupant health maintenance. Continue computational and experimental research; finalize report on air contaminant and biological survey data, including evaluations on use of endotoxins, and on respiratory symptomology. Begin air flow modeling using computational fluid dynamics to assess ventilation and air mixing onboard aircraft, And firm guidelines for cabin occupant health maintenance. Feasibility study for determining the incidence of infectious diseases in individuals working in enclosed aircraft environment Collect data on the incidence of infectious diseases. 	<p>FY00</p> <p>Q3</p> <p>Q4</p>	<p>FY01</p> <p>Q2</p> <p>Q4</p>	<p>FY02</p> <p>Q1</p> <p>Q4</p>
<p>16. Procurement Strategy/Acquisition Approach/Technology Transfer: The procurement strategies will be usual and customary. The research results will be sent to the Office of Aviation Medicine with recommendations as to actions that the FAA should take with respect to standards and rulemaking. The results of the studies will be made available to the aviation industry worldwide and to the scientific community. No equipment purchases above \$5K per item are foreseen for the defined projects.</p>			
<p>17. Justification/History: This research is responsive to the needs of the primary research sponsor (Office of Aviation Medicine). Additionally, this research is consistent with the FAA Research, Engineering, and Development (RE&D) Plan, and directly supports the Bioaeronautics portion of the National Plan for Civil Aviation Human Factors.</p>			
<p>18. Issues: The component of research incorporated within the FAA-NIOSH IA is required by direct language within the Appropriations guidance to the FAA.</p>			
<p>19. Transition Strategy: Not applicable</p>			
<p>20. Impact of Funding Deferral: Loss of funding for this task would seriously impair the ability of the FAA to advise FAA policy makers and the aviation community on radiation issues. Loss of funding would also make us noncompliant with the requirements referenced in Item # 18 above.</p>			

21. R&D Teaming Arrangements:

This research is coordinated with counterparts in the Environmental Protection Agency, the National Institute for Occupational Safety and Health, the National Oceanic and Atmospheric Administration, the National Research Council of Canada, the National Aeronautics and Space Administration, the American Society of Heating Ventilation and Air-Conditioning Engineers, the American Society for Testing and Materials, United States Air Force, and the Society of Automotive Engineers.

22. Special Facility Requirements:

The laboratory tools within the Radiobiology Research Team of the Toxicology and Accident Research Laboratory of the Aeromedical Research Division is essential to the conduct of this research.

23. Approvals (Signature Authority):**Performing Organization**

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